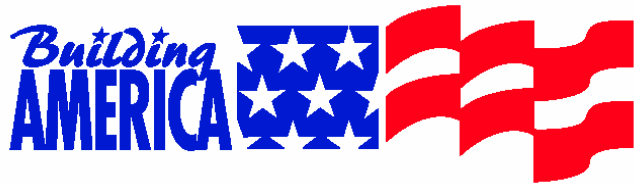


Residential Best Practices:

Integrating Building Science with Above Code Programs



Laura Uhde

2006 National Workshop on
State Building Codes

Denver, CO

August 2, 2006



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Southface Energy Institute



- Education and Research
- Green Building Services
 - Commercial
 - Residential
 - Communities
- Policy
- Greenprints

Eco Office

Architect

Lord, Aeck & Sargent, Inc.

Contractor—

Eco Office Contractors: A Consortium of Green Builders

DPR Construction

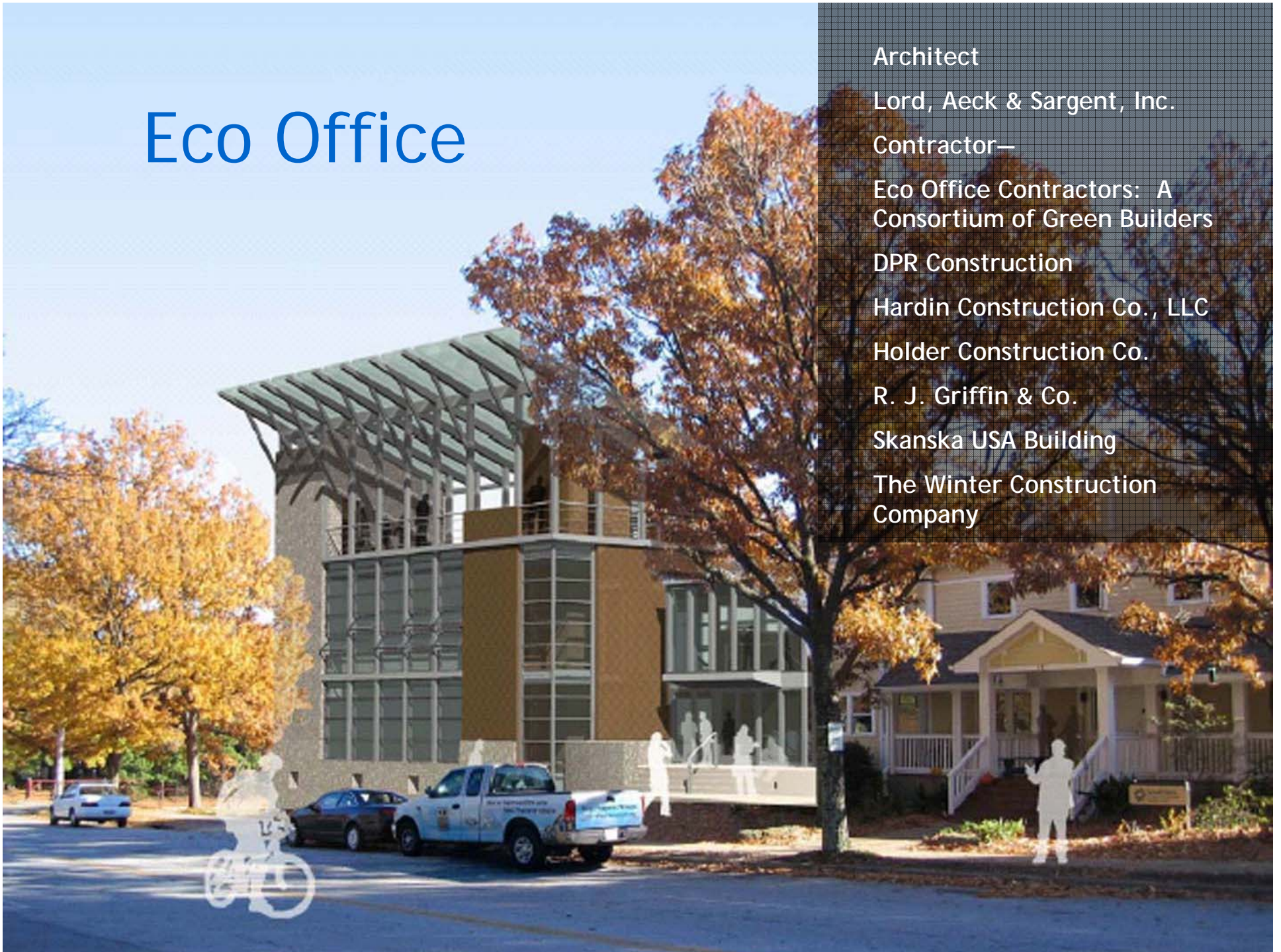
Hardin Construction Co., LLC

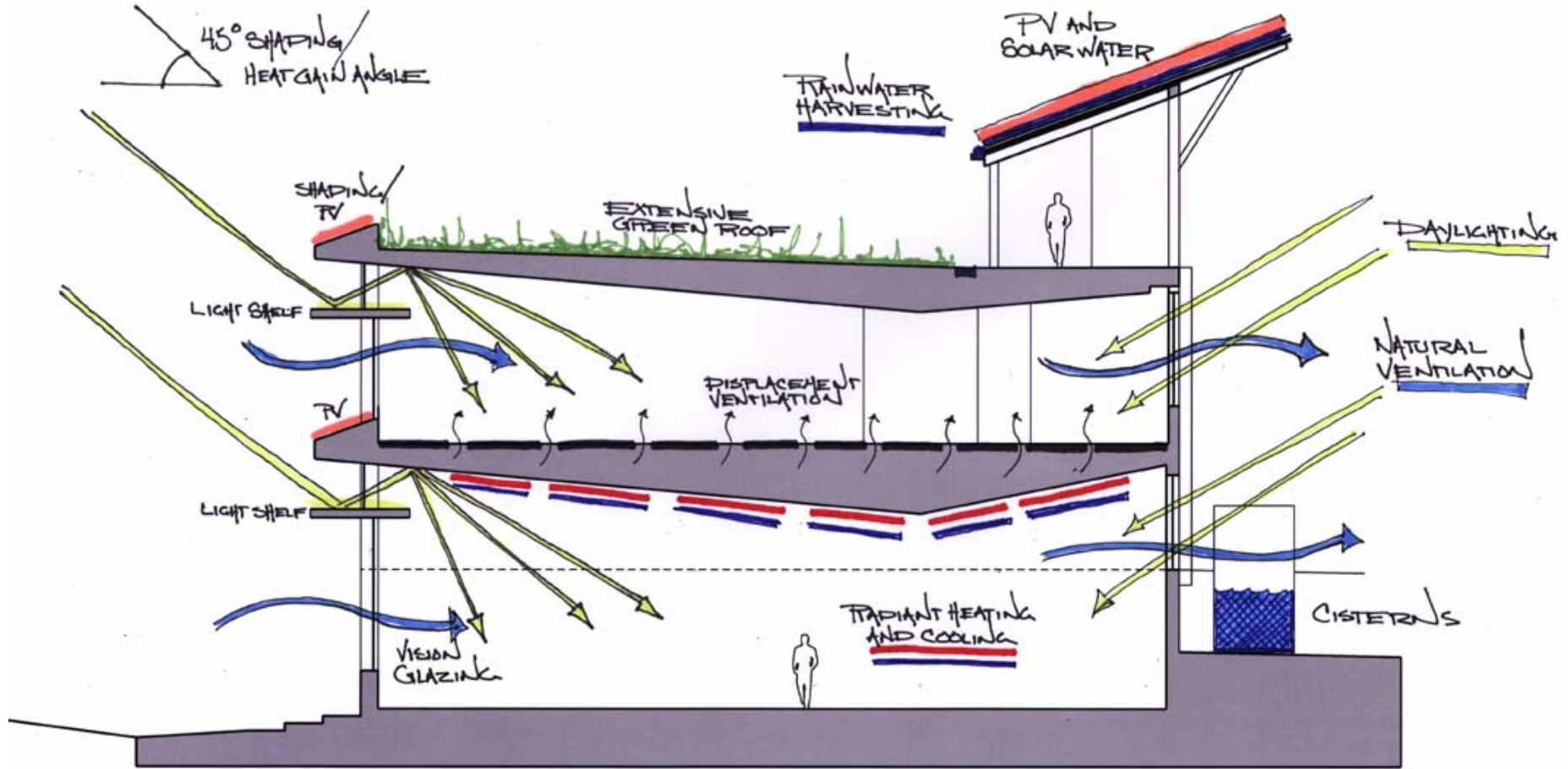
Holder Construction Co.

R. J. Griffin & Co.

Skanska USA Building

The Winter Construction Company



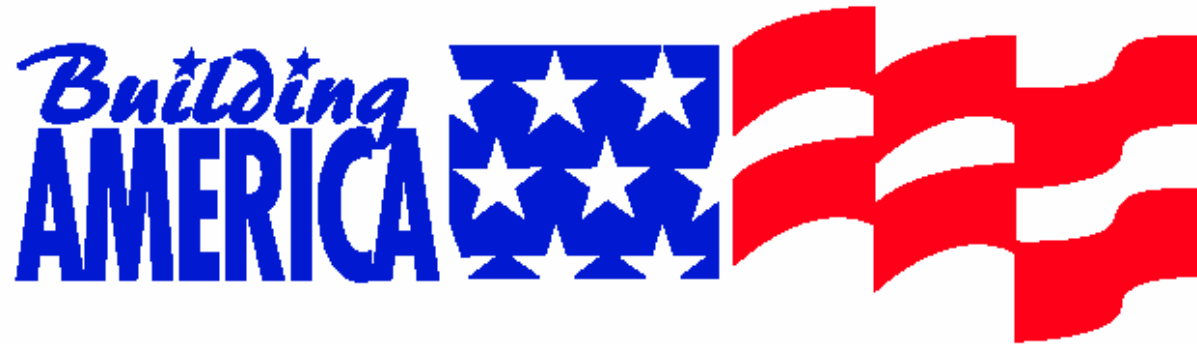


TYPICAL SECTION



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- 30% - 90% improvement from energy efficiency
- "zero-energy" (ZEH) homes (2020)
- Reduce construction time and waste
- Improve builder productivity
- New product opportunities
- Implement innovative energy- and material-saving technologies.



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Building America
U.S. Department of Energy

Research that Works

Building America Puts Residential Research Results To Work

Residential buildings use more than 20% of the energy consumed annually in the United States. To help reduce that energy use, the Department of Energy (DOE) and its Building America partners conduct research to develop advanced building energy systems that make homes and communities much more energy-efficient. DOE

Who benefits from energy-efficient homes?

Consumers:

Lower energy bills and maintenance costs

Southface & Building America





EarthCraft House Program

Tier 1 - 15%

Tier 2 - 30%

Tier 3 - 40%



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Responsible Solutions for Environmental Living

Southern Living Idea House at Glenwood Park



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Idea House at Glenwood Park

Site Features

- Brownfield
- Rainwater irrigation
- Water bags
- Erosion control
- Recycling



Idea House at Glenwood Park

Exterior Features

- Pervious cement
- Landscaping and irrigation
- Insulated drainage board
- Extensive flashing
- Fiberglass-faced exterior sheathing
- Insulated over-sheathing
- Recycled and reclaimed porch decking



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Responsible Solutions for Environmental Living

Idea House at Glenwood Park PV System

- 1.4 kW PV
- Grid connected
- Net metering (\$0.15/kWh buyback)



Idea House at Glenwood Park

Housewide Features

- Reclaimed wood flooring
- Pre-finished and low-VOC floor covering
- Sustainably harvested wood
- R-20 open-cell spray foam
- Low or no-VOC paints
- HP Windows
- Tankless water heaters
- On-demand hot water system



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Responsible Solutions for Environmental Living

Idea House at Glenwood Park

Kitchen/Bath/Laundry Features

- Lighting controls
- ENERGY STAR light fix. & appliances
- Mold resistant tile backer and wet area wall board
- Composite countertops
- ENERGY STAR dishwasher, washer and dryer
- HP bath fans
- Low-flow fixtures
- Bathwater reuse



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Idea House at Glenwood Park

Crawlspace/Attic Features

- Sealed conditioned crawl and attic
- R-30 open-cell spray foam
- SEER 19 AC with dual-fuel, sealed combustion 94.5 AFUE gas furnaces
- Detailed load calculation & duct design
- Programmable thermostats & zone controls
- ERV
- Media filters
- HEPA filters
- Tight ducts inside



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Responsible Solutions for Environmental Living

Idea House at Glenwood Park Results

- Modeled 38% > BA Benchmark; 44% w/PV
- Main house: 0.35 cfm₅₀/sfbe (3325 cfm₅₀)
- Carriage house: 0.35 cfm₅₀/sfbe (613 cfm₅₀)
- Crawlspace db 7% (140 cfm₂₅)
- Attic db 3.3% (48 cfm₂₅)

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- A & R Ironworks
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- Alexander Interior Services
- Allison Carter
- Alyia Gallery
- AM Waterproofing
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- WeatherTRAK

*Indicates a national sponsor.

Coordination issues?

Jan 01 2006, 00:15 -To- Jul 31 2006, 00:00 EST

Electricity		
	kWh	
Energy Produced by PV	1028.5	<div></div>
Energy from Grid	9415.5	<div></div>
Energy to Grid	45.4	<div></div>
Total Energy Demand	10597.6	<div></div>
Incident Solar Resource	9665.3	<div></div>
Space Conditioning Energy		
	kWh/day	
First Floor Heat Pump	3357.5	<div></div>
Second & Third Floor Heat Pump	2036.1	<div></div>
First Floor Misc. Mechanical Equipment	3516.6	<div></div>
Second Floor & Third Floor Mech. Equipment	2369.6	<div></div>
Second & Third Floor Fan Energy	391.3	<div></div>
First Floor Fan Energy	70.4	<div></div>
Environment		
	Average	Min/Max
Outdoor Temperature (deg. F)	65.0	27.7/ 97.7
Outdoor Humidity (%)	57.6	20.0/ 100.0
Crawlspace Temperature (deg. F)	68.3	58.5/ 84.3
Crawlspace Humidity (%)	52.7	30.0/ 70.0
First Floor Temperature (deg. F)	71.8	54.7/ 77.6
First Floor Humidity (%)	45.6	30.0/ 60.0
Master Bedroom Temperature (deg. F)	71.7	54.8/ 79.0
Master Bedroom Humidity (%)	42.6	20.0/ 60.0
Second Floor Temperature (deg. F)	72.1	54.0/ 79.5
Second Floor Humidity (%)	40.8	20.0/ 70.0
Third Floor Temperature (deg. F)	73.3	53.6/ 90.5
Third Floor Humidity (%)	47.2	30.0/ 70.0
Garage Suite Temperature (deg. F)	70.7	41.7/ 88.1
Garage Suite Humidity (%)	39.7	20.0/ 70.0
Energy Recovery Ventilator Temperature (deg. F)	68.0	47.4/ 77.5
Energy Recovery Ventilator Humidity (%)	47.6	10.0/ 80.0



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Responsible Solutions for Environmental Living

Jul 01 2006, 00:15 -To- Jul 31 2006, 00:00 EST

Electricity	kWh	
Energy Produced by PV	160.1	<div></div>
Energy from Grid	2471.4	<div></div>
Energy to Grid	0.0	<div></div>
Total Energy Demand	2654.5	<div></div>
Incident Solar Resource	1577.5	<div></div>
Space Conditioning Energy	kWh/day	
First Floor Heat Pump	1335.8	<div></div>
Second & Third Floor Heat Pump	876.8	<div></div>
First Floor Misc. Mechanical Equipment	604.5	<div></div>
Second Floor & Third Floor Mech. Equipment	522.4	<div></div>
Second & Third Floor Fan Energy	1.0	<div></div>
First Floor Fan Energy	4.6	<div></div>
Environment	Average	Min/Max
Outdoor Temperature (deg. F)	83.1	68.6/ 97.7
Outdoor Humidity (%)	54.7	30.0/ 90.0
Crawlspace Temperature (deg. F)	72.5	70.7/ 82.0
Crawlspace Humidity (%)	56.5	50.0/ 60.0
First Floor Temperature (deg. F)	76.1	75.0/ 77.6
First Floor Humidity (%)	52.5	40.0/ 60.0
Master Bedroom Temperature (deg. F)	76.1	73.8/ 79.0
Master Bedroom Humidity (%)	51.2	40.0/ 60.0
Second Floor Temperature (deg. F)	76.2	74.7/ 78.4
Second Floor Humidity (%)	50.0	50.0/ 50.0
Third Floor Temperature (deg. F)	76.3	72.4/ 82.5
Third Floor Humidity (%)	56.4	50.0/ 60.0
Garage Suite Temperature (deg. F)	79.6	76.5/ 88.1
Garage Suite Humidity (%)	38.4	20.0/ 50.0
Energy Recovery Ventilator Temperature (deg. F)	75.6	72.1/ 77.5
Energy Recovery Ventilator Humidity (%)	53.1	40.0/ 60.0



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Outreach

6,875

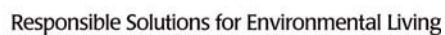


Better Homes and Gardens America's Home



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America's Home Features

- Sealed conditioned crawl
- R-26 SIP walls
- R-42 SIP roof
- ENERGY STAR appliances
- Glazing U-factor $< .33$, SHGC $< .36$
- Tankless water heater
- Modeled 33% total savings
- $0.2 \text{ CFM}_{50}/\text{SFBE}$



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America's Home Features

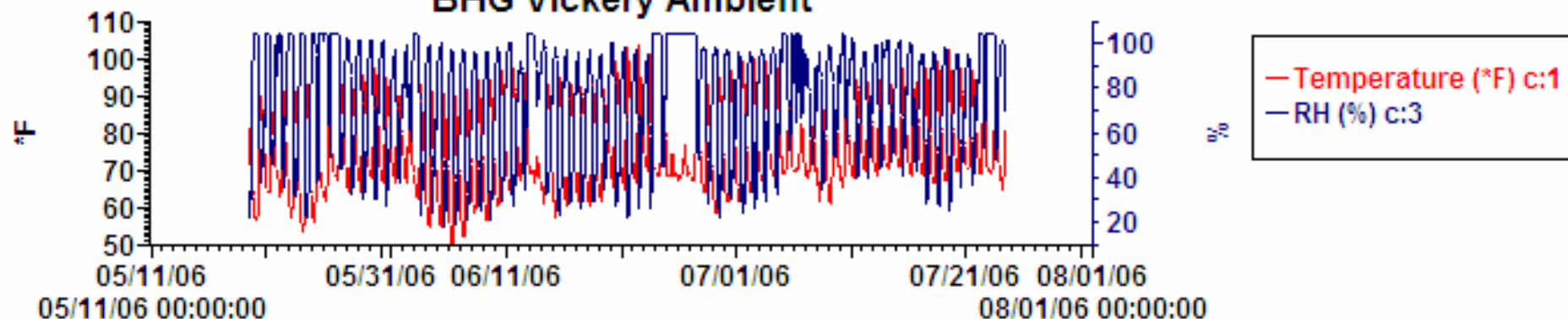
- SEER 13 heat pump
- Detailed load calculation & duct design
- Web joists
- Whole house dehumidification
- Media filters
- Tight ducts in conditioned space
- Airflow tested & balanced



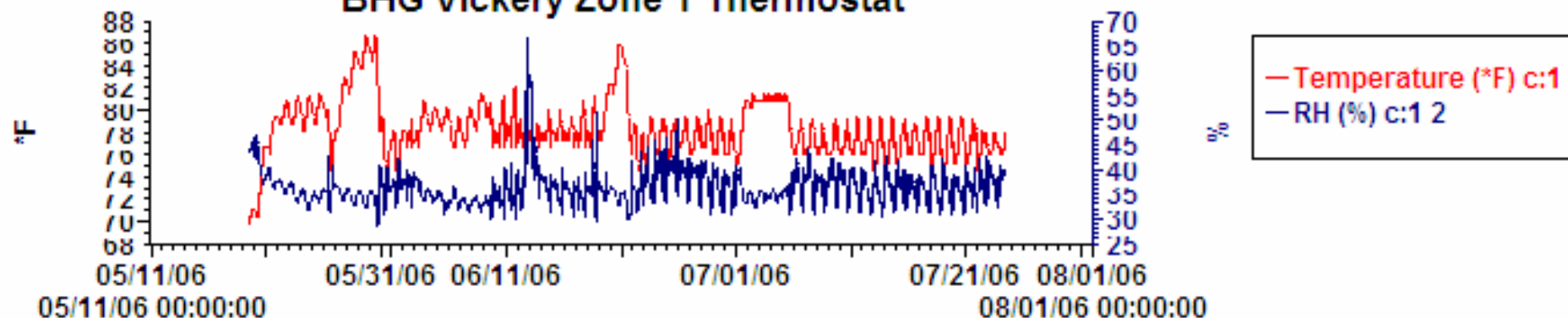
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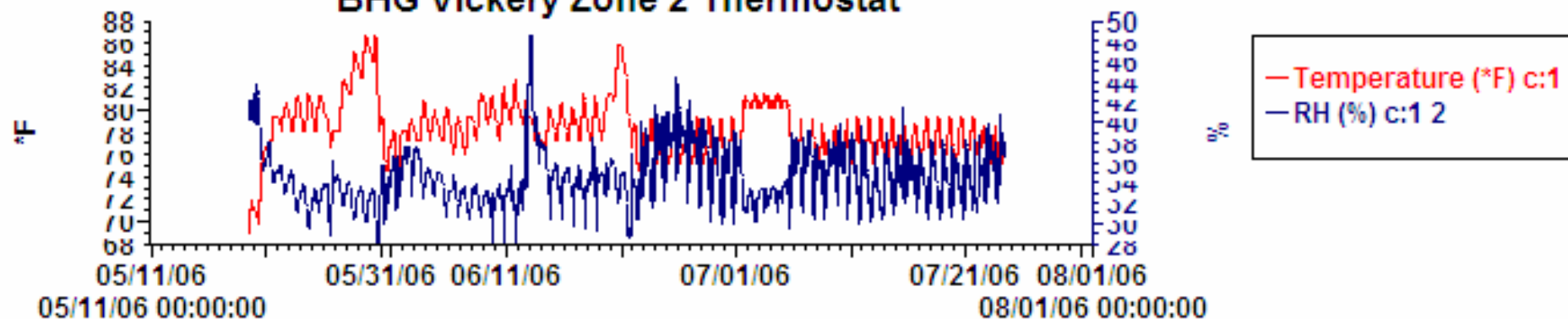
BHG Vickery Ambient

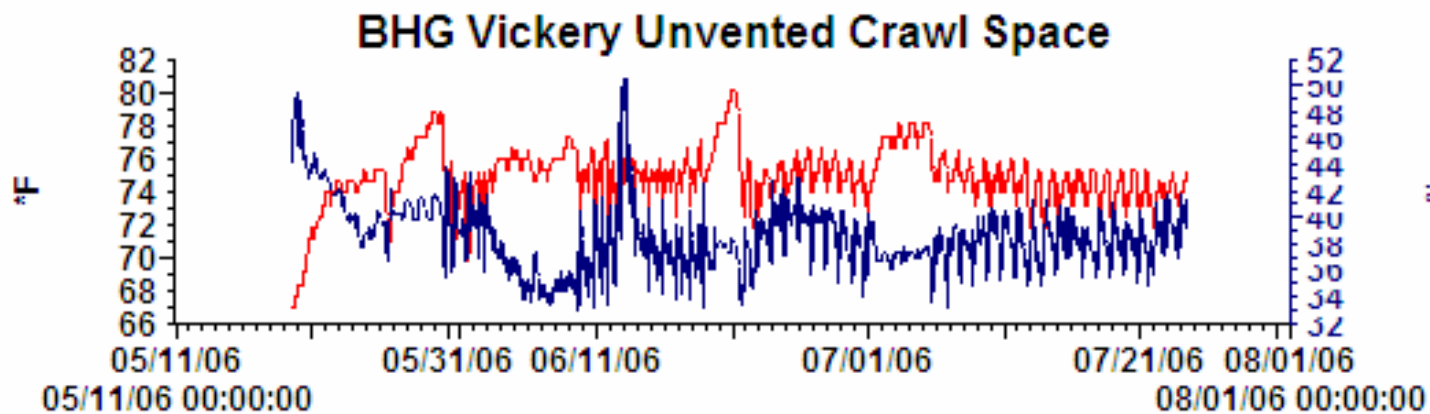
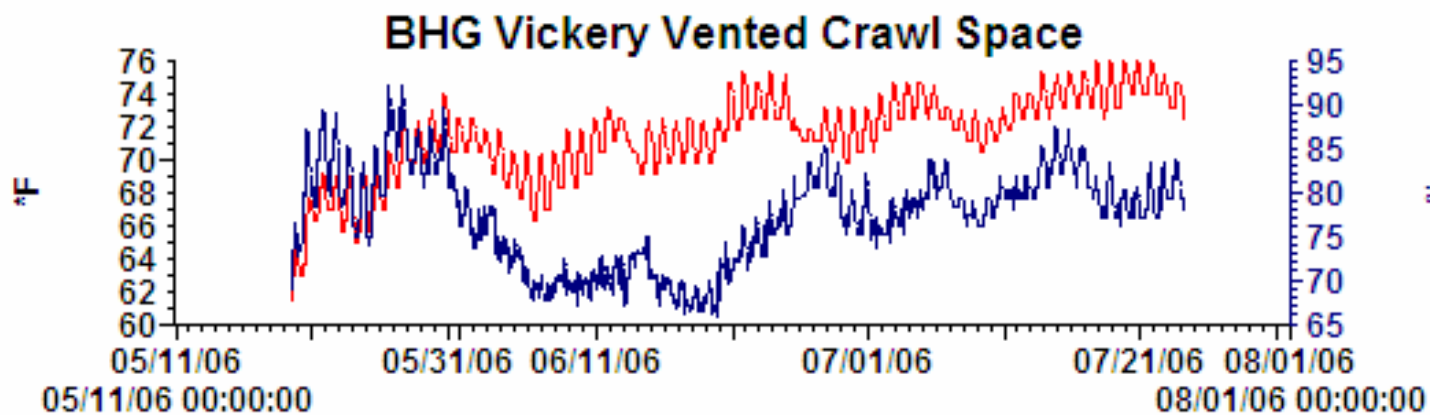


BHG Vickery Zone 1 Thermostat



BHG Vickery Zone 2 Thermostat





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Tour America's Home

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• Builder Profile: Pam Sessions >>

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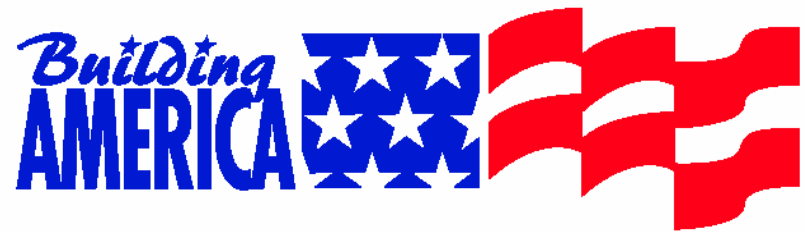
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